Description for the general public

Random Matrix Theory describes objects which are tables of random numbers. It is the focus of active research in the areas of mathematics and physics and is used as a tool in many interdisciplinary applications. Its ubiquity is the result of a property called universality. Some statistical properties of random matrices do not depend on the details of their description. This is why we can use them to model such diverse setups as a certain bus system in Mexico or a two dimensional theory of quantum gravity.

Information Theory, on the other hand is the study of quantification, transmission and storage of information. In some sense, everything around us can be seen as an emanation of information and its manipulation. Indeed, technologically and in some sense philosophically, we live in the age of information. Recently, information theory and particularly some information based quantities are being exploited in describing complex systems. Their advantage is that they work for many types of such systems. They are, in this sense universal, but more importantly, they are able to capture common (universal) features of those systems.

The aim of this project is to further the understanding of random matrix theory related problems by assuming an information-theoretic perspective. The idea is that the border between those two areas will prove to be a fruitful ground for new discoveries in statistical and complex systems physics. We will particularly explore three topics emerging in that context: universal probability distributions and phase transitions in random matrix related complex systems (and their relation to information theoretic measures) and the data analysis methods fusing the tools form the two subjects.